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11. (New) A solenoid in accordance with Claim 8 wherein said solenoid is included in an actuator attachable to a device for providing linear actuation to said device.

12. (New) A solenoid in accordance with Claim 8 wherein the respective diameters of  
5 said bearing bore and said shaft are as nearly identical as is possible without engendering drag on  
said shaft.

## REMARKS

Claims 1-7 are pending and rejected in this present application. Claim 1 is amended hereby to correct informalities. New claims 8-12 are hereby added.

Responsive to the rejection of claims 1-5 under 35 USC §112, second paragraph, Applicants have amended claim 1. More particularly, Applicants have amended claim 1 to clarify the limitation of "a bearing axially disposed in one of said first and second polepieces". The amendment does not constitute new matter. Applicants submit that claim 1, and claims 2-5 depending therefrom are now in allowable form.

Responsive to the rejection of claims 1, 2 and 4 under 35 U.S.C. §102(b) as anticipated by U.S. Patent No.5,782,267 (Yoo), Applicants respectfully traverse.

Yoo discloses, a solenoid coil 5 (*Fig. 2*) inserted in a space between housing 2 and cylinder 11. The cylinder 11 (*Fig. 4*) serves to protect the solenoid assembly from fluid in the chamber. (*column 5, line 65 through column 6, line 1*). Additionally Yoo discloses a solenoid cover 3, fitted to cylinder 11 and coupled to housing 2. (*column 6, lines 26-35*). The solenoid coil 5 is thereby wrapped around the solenoid cover 3. (*see Figs. 2 and 4*).

In contrast claim 1 recites in part, a solenoid comprising "first and second polepieces having axial bores coaxially disposed along a common axis" and "an electrical conductor wound around said polepieces in a plurality of turns". (*Emphasis Added*). Applicants submit that such a structure is not disclosed by the cited reference.

The coil of Yoo is wrapped around a cylinder 11, used to protect the coil from fluids. A protrusion 19 of the solenoid cover 3 is then inserted into the cylinder 11, effectively wrapping the coil around the cover 3. (*column 6, lines 6-9*). Although the office action did not particularly identify the items of Yoo corresponding to the two polepieces, the coil 5 of Yoo is not wrapped around the housing 2, or any item that may be identified as a second polepiece. The coil 5 of Yoo is actually contained within the housing 2. Thus, even if the housing 2 was considered the second polepiece, Yoo fails to disclose an electrical conductor wrapped around the first and second polepieces in a plurality of turns.

Applicants respectfully point out that the coil, or electrical conductor of Yoo is not wound around the first and second polepieces in a plurality of turns, therefore Yoo fails to anticipate claim 1.

For the foregoing reasons, Applicants submit that claim 1 and claims 2-5 depending therefrom are in condition for allowance, which is hereby respectfully requested.

Claims 5 was rejected under 35 U.S.C. §103(a) as being unpatentable over Yoo. However, Applicants respectfully point out that claim 5 depends from claim 1, which is in condition for allowance for the reasons given above. Accordingly, claim 5 is also in condition for allowance, which is hereby respectfully requested.

Claim 3 was rejected under 35 U.S.C. §103(a) as being unpatentable over Yoo in view of Deland, U.S. Patent No. 4,527,590 (Kolze), or , U.S. Patent No. 5,362,209 (Day).

Applicants respectfully point out that the Examiner has not provided a patent number for the Deland reference, nor is the Deland reference included in the attached notice of cited references. Therefore, Applicants were unable to consider the Deland reference.

The rejection states that the "frusto-conical" shape is a design choice and given no patentable weight. The rejection further states that the Applicants did not disclose how the shape solves any stated problem. Applicants respectfully traverse.

The "frusto-conical" shape of the solenoid allows the device to negate the effects of armature decentering as caused by gravity, thereby allowing the solenoid to be used in any orientation without a loss of effectiveness. As stated in the disclosure, the "frusto-conical" tapering of the armature provides for "the absolute minimum thickness of air gap while positively precluding the armature from striking the polepieces." This tapering of the armature will be equal and opposite to the cone angle as defined by the excursion limit of the shaft in the bearing. Thus maintaining a minimum air gap, while assuring that the armature can not strike the polepiece. (*page 2, lines 14-22, and page 5, line 15 through page 6, line 1*). Therefore, Applicants respectfully submit that the limitations of claim 3 should have been given patentable weight, and that a *prima facie* case of obviousness has not been established.

Additionally, Applicants respectfully point out that claims 3 depends from claim 1, which is in condition for allowance for the reasons given above. Accordingly, claim 3 is also in condition for allowance, which is hereby respectfully requested.

Claims 6 and 7 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,779,220 (Nehl et al.) in view of Yoo.

The examiner relies on Yoo to teach the solenoid valve of the claimed invention, and Nehl to teach the use of a solenoid valve in an EGR valve. As discussed above Yoo does not

disclose the solenoid valve of the present invention. In particular, Claims 6 and 7 each include the limitation of the electrical conductor wrapped around first and second polepieces in a plurality of turns. Yoo fails to disclose this limitation, hence the combination of Yoo and Nehl can not result in the claimed invention.

To establish a *prima facie* case of obviousness, there must be some suggestion or motivation to modify the reference or to combine the teachings of the references. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). Therefore, if a proposed modification renders the prior art device unsatisfactory for its intended purpose, a suggestion or motivation to make the modification is lacking and a *prima facie* case of obviousness has not been established. Therefore, Applicants respectfully submit that a prima face case of obviousness has not been established.

For the foregoing reasons, Applicants submit that claims 6 and 7 are in condition for allowance and respectfully request same.

Claims 8-12 have been added hereby to further protect the patentable subject matter of the present invention. Applicants submit that new claims 8-12 are fully supported by the original disclosure, and are not anticipated by the cited prior art applications. More particularly, claim 8 recites in part, "a housing ... first and second polepieces, within said housing, having axial bores coaxially disposed along a common axis". Fig. 2 of the present invention discloses a housing 12 containing polepiece 14 and polepiece 16. Thus, Applicants submit that claims 8-12 are in condition for allowance, and respectfully request same.

In the event Applicants have overlooked the payment of fee, or additional payment of fee,  
Applicants hereby conditionally petition therefore and authorize that any changes be made to  
Deposit Account No. 50-0831, DELPHI TECHNOLOGIES, INC.

Should you have any questions regarding the enclosed, please do not hesitate to contact  
me.

Respectfully submitted,

Dated: 8-9-02



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Docket No.  
89190.157900/DP-303637

**IN THE UNITED STATES PATENT & TRADEMARK OFFICE**

Applicant(s):	Bircann, et al.	)	
		)	
Serial No.:	09/777,471	)	
		)	Examiner : Bonderer, D
Filed:	February 6, 2001	)	
		)	Art Unit : 3625
For:	SLEEVELESS SOLENOID FOR A LINEAR ACTUATOR	)	
		)	
		)	

**MARKED-UP COPY OF AMENDMENTS TO THE CLAIMS**

Hon. Assistant Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

In compliance with Rule 1.121, Applicants hereby submit the following marked-up copy of the revisions made to the Claims by the Amendment submitted in response to the Office Action mailed May 9, 2002.

**IN THE CLAIMS**

Please amend claim 1 to read as follows:

1.(Amended) 1. A solenoid for providing linear actuation, comprising:

- a) first and second polepieces having axial bores coaxially disposed along a common axis;
- b) an electrical conductor wound around said polepieces in a plurality of turns;
- c) an armature slidably disposed in said axial bores;
- 5 d) a bearing axially disposed in one of said first and second polepieces; and
- e) a shaft attached coaxially to said armature and extending through a supportive bore in said bearing, said shaft being axially displaceable by electromagnetic displacement of said armature to provide said actuation.

10 Please add new claims 8-12 as follows:

8. (*New*) A solenoid for providing linear actuation, comprising:
- a) a housing;
- b) first and second polepieces, within said housing, having axial bores coaxially disposed along a common axis;
- 15 c) an electrical conductor wound around said polepieces in a plurality of turns;
- d) an armature slidably disposed in said axial bores;
- e) a bearing axially disposed in one of said first and second polepieces; and
- f) a shaft attached coaxially to said armature and extending through a supportive bore in said bearing, said shaft being axially displaceable by electromagnetic displacement of said armature to provide said actuation.
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9. (*New*) A solenoid in accordance with Claim 8 wherein said armature is separated from said polepieces by a generally cylindrical air gap.

25 10. (*New*) A solenoid in accordance with Claim 8 wherein said armature is frusto-conical.

11. (New) A solenoid in accordance with Claim 8 wherein said solenoid is included in an actuator attachable to a device for providing linear actuation to said device.

5        12. (New) A solenoid in accordance with Claim 8 wherein the respective diameters of said bearing bore and said shaft are as nearly identical as is possible without engendering drag on said shaft.

Should you have any questions regarding the enclosed, please do not hesitate to contact me.

Respectfully submitted,

Dated: 89-02



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